DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-2, 4, 10, 11, 12, 17, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over MarkBreiter (US 3837172) in view of Child (US 5295350) and further in view of Kooy (US 4995234). In regard to claims 1-2, 4, 10, 11, 12, 17, 19, MarkBreiter teaches a regasification plant comprising a liquid natural gas feed (1) that is split into a first (2) and second portion (9), a heat source (3) that is cooled by the first portion liquid natural gas (1) to thereby form a heated first vapor portion (5); an expander (6) expanding the heated first vapor portion (5) to form an expanded first vapor portion (7); a demethanizer (8) that receives the expanded first vapor portion (7) and the second portion (9) is used as reflux (column 2, lines 45-50); the demethanizer (8) is configured to produce a lean gas (14) and a bottom product (13); and a

compressor (17) that is configured to compressor the lean gas (14) with work from the expander (6).

MarkBreiter does not explicitly teach a second booster pump on the line to the heating source (3) capable of raising the pressure at least 1000 psig over the pressure of pump (1). However, providing another pump to raise the working fluid to a higher pressure is a well known means of increasing the power output of the expansion step, as taught by Kooy (see pump 45, pump 51 and expansion engine 57, column 7, lines 10-30). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify MarkBreiter with a second pump and providing an at least 1000 psig higher pressure for the purpose of providing more power output from the turbine and for the purpose of providing electrical power output (column 7, lines 30-32).

MarkBreiter, as modified, does not explicitly teach that the heat source comprises a combined cycle power plant (thereby using the LNG as a heat sink), heating the first vapor portion (5) to at least 125F and 1450 psig, or producing electric power with the expansion work from expander (6). However, it is well known to use LNG as a heat sink as taught by Child. Child teaches heating LNG (1) as a heat sink for a combined cycle power plant (see figure) to form vapor (122) having a temperature of at least 125F and a pressure of at least 1450 psig (column 13, lines 50-55) and expanding the vapor with a turbine (183) to produce electricity (via 184); Child also teaches that it is known to simultaneously use expansion work for running compression (125) and a electric power generation (127). Therefore, it would have been obvious to one of ordinary skill in the

art, at the time the invention was made, to replace the heater (3) of MarkBreiter with a combined cycle power plant as taught by Child for the purpose of improving the efficiency of the power plant and for reducing the costs of heating the LNG. In regard to claim 18, Child teaches providing a fuel to the combined cycle power unit (via 91) from the liquefied natural gas (1).

Claims 1-2, 4, 10, 11, 12, 17, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over MarkBreiter in view of Child and further in view of Lewis (US 6195997). In regard to claims 1-2, 4, 10, 11, 12, 17, 19, MarkBreiter teaches a regasification plant comprising a liquid natural gas feed (1) that is split into a first (2) and second portion (9), a heat source (3) that is cooled by the first portion liquid natural gas (1) to thereby form a heated first vapor portion (5); an expander (6) expanding the heated first vapor portion (5) to form an expanded first vapor portion (7); a demethanizer (8) that receives the expanded first vapor portion (7) and the second portion (9) is used as reflux (column 2, lines 45-50); the demethanizer (8) is configured to produce a lean gas (14) and a bottom product (13); and a compressor (17) that is configured to compressor the lean gas (14) with work from the expander (6).

MarkBreiter does not explicitly teach a second booster pump on the line to the heating source (3) capable of raising the pressure at least 1000 psig over the pressure of pump (1). However, providing another pump to raise the working fluid to a higher pressure is a well known means of increasing the power output of expansion, as taught by Lewis (see LP pump and HP pump, which cools a waste heat source and is

expanded for energy generation, column 6, line 1-10). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify MarkBreiter with a second pump and providing an at least 1000 psig higher pressure for the purpose of providing more power output from the turbine and for the purpose of providing electrical power output (column 6, line 11).

MarkBreiter, as modified, does not explicitly teach that the heat source comprises a combined cycle power plant (thereby using the LNG as a heat sink), heating the first vapor portion (5) to at least 125F and 1450 psig, or producing electric power with the expansion work from expander (6). However, it is well known to use LNG as a heat sink as taught by Child. Child teaches heating LNG (1) as a heat sink for a combined cycle power plant (see figure) to form vapor (122) having a temperature of at least 125F and a pressure of at least 1450 psig (column 13, lines 50-55) and expanding the vapor with a turbine (183) to produce electricity (via 184); Child also teaches that it is known to simultaneously use expansion work for running compression (125) and a electric power generation (127). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to replace the heater (3) of MarkBreiter with a combined cycle power plant as taught by Child for the purpose of improving the efficiency of the power plant and for reducing the costs of heating the LNG. In regard to claim 18, Child teaches providing a fuel to the combined cycle power unit (via 91) from the liquefied natural gas (1).

Claims 5-7, 9, 13-15, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over MarkBreiter, Child, Kooy, and further in view of Burns (US 3362175). In regard to claims 5-6, MarkBreiter, as modified, teaches most of the claim limitations as indicated previously, but do not explicitly teach that the bottom product of the demethanizer is further processed with a deethanizer. However, it is well known to further process the bottom product to separate ethane from heavier components, as taught by Burns (see demethanizer 10, and deethanizer 129 having ethane product at top and bottom product 26). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to send the bottom product (13-MarkBreiter) to a deethanizer as taught by Burns for the purpose of separating ethane for use. However, Child teaches that the liquid natural gas may be heated (via 11) prior to the heating and expansion (via 25, 183), which suggests that it would have been obvious to provide cooling duty to a deethanizer reflux condenser as a means of reducing the required external refrigeration. Further, Burns teaches that the LNG is useful for providing the refrigeration duty of a condenser (14) and therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to employ the first portion as a coolant in the deethanizer condenser for the purpose of reducing external refrigeration and thereby the cost and equipment thereof. In regard to claim 9, see column 2, line 50-55. In regard to claim 13-14, see claims 5-7. In regard to claims 15, 20, it is noted that using the ethane for fuel for the system is seen as obvious to an ordinary practitioner in the art as ethane is a well known fuel, and it is well known that ethane will increase the heating value of the fuel.

Claims 5-7, 9, 13-15, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over MarkBreiter, Child, Lewis, and further in view of Burns. In regard to claims 5-6, MarkBreiter, as modified, teaches most of the claim limitations as indicated previously, but do not explicitly teach that the bottom product of the demethanizer is further processed with a deethanizer. However, it is well known to further process the bottom product to separate ethane from heavier components, as taught by Burns (see demethanizer 10, and deethanizer 129 having ethane product at top and bottom product 26). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to send the bottom product (13-MarkBreiter) to a deethanizer as taught by Burns for the purpose of separating ethane for use. In regard to claim 7, MarkBreiter, as modified, teaches most of the limitations but do not explicitly teach cooling the deethanizer reflux condenser with the first portion prior to heating and expansion. However, Child teaches that the liquid natural gas may be heated (via 11) prior to the heating and expansion (via 25, 183), which suggests that it would have been obvious to provide cooling duty to a deethanizer reflux condenser as a means of reducing the required external refrigeration. Further, Burns teaches that the LNG is useful for providing the refrigeration duty of a condenser (14) and therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to employ the first portion as a coolant in the deethanizer condenser for the purpose of reducing external refrigeration and thereby the cost and equipment thereof. In regard to claim 9, see column 2, line 50-55. In regard to claim 13-14, see claims 5-7. In regard to claims 15, 20, it is noted that using the ethane for fuel for the system is seen as obvious

to an ordinary practitioner in the art as ethane is a well known fuel, and it is well known that ethane will increase the heating value of the fuel.

Claims 5-7, 9, 13-15, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over MarkBreiter, Child, Kooy, and further in view of Denahan (US 3405530). In regard to claims 5-6, MarkBreiter, as modified, teaches most of the claim limitations as indicated previously, but do not explicitly teach that the bottom product of the demethanizer is further processed with a deethanizer. However, it is well known to further process the bottom product to separate ethane from heavier components, as taught by Denahan (see demethanizer 6, and deethanizer 14 having ethane product at top and bottom product). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to send the bottom product (13-MarkBreiter) to a deethanizer as taught by Denahan for the purpose of separating ethane for use. In regard to claim 7, MarkBreiter, as modified, teaches most of the limitations but do not explicitly teach cooling the deethanizer reflux condenser with the first portion prior to heating and expansion. However, Child teaches that the liquid natural gas may be heated (via 11) prior to the heating and expansion (via 25, 183), which suggests that it would have been obvious to provide cooling duty to a deethanizer reflux condenser as a means of reducing the required external refrigeration. Further, Denahan teaches that the LNG is useful for providing the refrigeration duty of deethanizer condenser (18) and therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to employ the first portion as

a coolant in the deethanizer condenser for the purpose of reducing external refrigeration and thereby the cost and equipment thereof. In regard to claim 9, see column 2, line 50-55. In regard to claim 13-14, see claims 5-7. In regard to claims 15, 20, it is noted that using the ethane for fuel for the system is seen as obvious to an ordinary practitioner in the art as ethane is a well known fuel, and it is well known that ethane will increase the heating value of the fuel.

Claims 5-7, 9, 13-15, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over MarkBreiter, Child, Lewis, and further in view of Denahan. In regard to claims 5-6, MarkBreiter, as modified, teaches most of the claim limitations as indicated previously, but do not explicitly teach that the bottom product of the demethanizer is further processed with a deethanizer. However, it is well known to further process the bottom product to separate ethane from heavier components, as taught by Denahan (see demethanizer 6, and deethanizer 14 having ethane product at top and bottom product). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to send the bottom product (13-MarkBreiter) to a deethanizer as taught by Denahan for the purpose of separating ethane for use. In regard to claim 7, MarkBreiter, as modified, teaches most of the limitations but do not explicitly teach cooling the deethanizer reflux condenser with the first portion prior to heating and expansion. However, Child teaches that the liquid natural gas may be heated (via 11) prior to the heating and expansion (via 25, 183), which suggests that it would have been obvious to provide cooling duty to a deethanizer reflux condenser as a means of

reducing the required external refrigeration. Further, Denahan teaches that the LNG is useful for providing the refrigeration duty of deethanizer condenser (18) and therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to employ the first portion as a coolant in the deethanizer condenser for the purpose of reducing external refrigeration and thereby the cost and equipment thereof. In regard to claim 9, see column 2, line 50-55. In regard to claim 13-14, see claims 5-7. In regard to claims 15, 20, it is noted that using the ethane for fuel for the system is seen as obvious to an ordinary practitioner in the art as ethane is a well known fuel, and it is well known that ethane will increase the heating value of the fuel.

Claims 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rambo (US 5114451) in view of Child and further in view of Kooy. In regard to claims 17-18, Rambo teaches a regasification plant comprising a liquid natural gas feed (21) that is split into a first (26) and second portion (23), a heat source (12) that is cooled by the first portion liquid natural gas (26) to thereby form a heated first vapor portion (27); an expander (14) expanding the heated first vapor portion (27) to form an expanded first vapor portion (31); a demethanizer (15) that receives the expanded first vapor portion (31) and the second portion (23) is fed to the demethanizer (15); the demethanizer (15) is configured to produce a lean gas (51) and a bottom product (32); and a compressor (17) that is configured to compressor the lean gas (51).

Rambo does not teach that the first portion is at least 1000psig greater that the second portion. However, Rambo suggests providing the expander (14) as a

turboexpander (column 3, lines 50-55) and further suggests providing a second booster pump for the purpose of raising the pressure for more work extraction. Further, providing another pump to raise the working fluid to a higher pressure is a well known means of increasing the power output of the expansion step, as taught by Kooy (see pump 45, pump 51 and expansion engine 57, column 7, lines 10-30). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Rambo with a second pump on line 26 and providing an at least 1000 psig higher pressure for the purpose of providing more power output from the turbine and for the purpose of providing electrical power output (kooy-column 7, lines 30-32) and for the purpose for providing power to a o compressor of the system thus reducing the external power required.

Rambo, as modified, does not explicitly teach that the heat source comprises a combined cycle power plant (thereby using the LNG as a heat sink), heating the first vapor portion (5) to at least 125F and 1450 psig, or producing electric power with the expansion work from expander (6). However, it is well known to use LNG as a heat sink as taught by Child. Child teaches heating LNG (1) as a heat sink for a combined cycle power plant (see figure) to form vapor (122) having a temperature of at least 125F and a pressure of at least 1450 psig (column 13, lines 50-55) and expanding the vapor with a turbine (183) to produce electricity (via 184); Child also teaches that it is known to simultaneously use expansion work for running compression (125) and a electric power generation (127). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to replace the heater (12) of Rambo with a

combined cycle power plant as taught by Child for the purpose of improving the efficiency of the power plant and for reducing the costs of heating the LNG. In regard to claim 18, Child teaches providing a fuel to the combined cycle power unit (via 91) from the liquefied natural gas (1).

Response to Arguments

Applicant's arguments with respect to claims 1, 10 and 17 have been considered but are moot in view of the new ground(s) of rejection. Applicant's arguments (page 5, ¶ 5) are that providing a higher pressure would interfere with the operation of the column of Markbrieter. In response, it is noted that increasing the pressure from the pumps merely allows a greater pressure drop or expansion in the turbo-expander and thereby provides further energy generation and would not mandate higher pressures in the column. Therefore, the argument is unpersuasive.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John F. Pettitt whose telephone number is 571-272-0771. The examiner can normally be reached on M-F 8a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler or Frantz Jules can be reached on 571-272-4834 or 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John F Pettitt /
Examiner, Art Unit 3744

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